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EXAMINER

CIESLEWICZ, ANETA B

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 04/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/076,559

Applicant(s)

FREIDHOFF, CARL B.

Examiner

Aneta B. Cieslewicz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☒ Claim(s) 10, 14, 15, 21 and 22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claims 10, 14, 15 and 22 are objected to because of the following informalities:

On lines 1 and 2 of claim 10, it is suggested that the claim language “wherein the second film is the same material” be changed to “wherein the second film is made from the same material” for clarification purposes.

On line 2 of claim 14 “the movable member” should be changed to “the moving member” in order to be consistent with the term used in claim 1.

On line 1 of claim 15, because the claim is drawn to a method of making, it is suggested that the claim language, “The method of claim 1, wherein a plurality of” be changed to “The method of claim 1, further comprising forming a plurality of”. Furthermore, it is suggested that microelectromechanical be changed to micro-electromechanical in order to be consistent with the term used claim 1.

On line 8 of claim 22, “control” should be inserted before “circuit”.

On line 12 of claim 22, it is suggested that “moving member” be changed to “movable member” in order to be consistent with the term defined on line 5.

On line 15 of claim 22, “an hermetic” should be corrected to “a hermetic”.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

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The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 16, 22 and 25 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In particular:

On lines 5, 7 and 9 of claim 16, the specification contains no disclosure of the actuation element claimed.

On lines 3, 5 and 6 of claim 22, the specification contains no disclosure of the actuating element claimed.

On line 3 of claim 25, the specification contains no disclosure of the curing step claimed.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 7, 12, 16, 22, 24 and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular:

On line 3 of claim 7, “the switch” lacks antecedent basis. For the purpose of the examination it will be assumed that “the switch” refers to “the micro-electromechanical device”.

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On lines 1 and 2 of claim 12, “the miniature electromechanical device” lacks antecedent basis. For the purpose of the examination it will be assumed that “the miniature electromechanical device” refers to the “micro-electromechanical device”.

On lines 5, 7 and 9 of claim 16, it is not clear what is “first actuation element”. For the purpose of the examination it will be assumed that the actuation element is an electrode (32).

On lines 3, 5 and 6 of claim 22, it is not clear what is the claimed “actuating element”? For the purpose of the examination it will be assumed that the actuation element is an electrode (32).

On line 5 of claim 22, it is not clear what exactly is formed by the “defining a movable member” method step? For the purpose of the examination it will be assumed that the first sacrificial layer is formed over the actuation element.

On line 9 of claim 22, limitation “the sacrificial layer” lacks antecedent basis. For the purpose of the examination it will be assumed that “the sacrificial layer” refers to “the first sacrificial layer.”

On line 9 of claim 22, the limitation “removing portions of the sacrificial layer around the movable member but not between the moving member and the substrate” is not clear. Specifically, according to the specification, the first sacrificial layer (40) is formed between the movable member (44) and the substrate (24). Therefore, it is not clear which portion of the first sacrificial layer are around the movable member. For the purpose of the examination it will be assumed that the first sacrificial layer is removed.

On line 1 of claim 24, “said step of applying a second sacrificial layer” lacks antecedent basis.

On line 3 of claim 25, it is unclear what happens during the curing step claimed. For the purpose of the examination it will be assumed that the first and second sacrificial layers are baked after deposition, as disclosed in the specification on page 9, line 26.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 2, 4-6, 8-12, 16 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Habermehl et al., US 6,174,820 B1.

Re claim 1, Habermehl et al. disclose a method of manufacturing a micro-electromechanical device (e.g. Figures 5a-5q) comprising the steps of: forming a moving member (110) on a first substrate (12) such that a first sacrificial layer (34) is disposed between the moving member and the substrate; encapsulating the moving member, including the first sacrificial layer, with a second sacrificial layer (34); coating the second sacrificial layer with a first film (70/72) formed of a material that establishes a hermetic seal with the substrate; and removing the first and second sacrificial layers (e.g. column 14, lines 8-12 and column 15, lines 3-5).

Re claim 2, the method disclosed by Habermehl et al., further comprises the step of forming an opening (92) in the first film prior to removing the first and second sacrificial layers (e.g. column 16, lines 28-40).

Re claim 4, in the method disclosed by Habermehl et al., the opening-forming step is performed after the coating step (e.g. column 16, lines 28-40 and Figure 5p).

Re claim 5, the method disclosed by Habermehl et al., further comprises the step of sealing (94) the opening after the first and second sacrificial layers are removed (e.g. column 16, lines 44-45 and Figure 5q).

Re claim 6, in the method disclosed by Habermehl et al., the sealing step is performed by depositing (coating) a second film on the first film wherein the second film formed of the same material as the first film (e.g. column 16, lines 44-45, Figure 5q and column 14, lines 9-10).

Re claim 8, the method disclosed by Habermehl et al., further comprises the step of forming a conductive layer (86) on the first film (e.g. column 15, lines 30-45 and Figure 5m).

Re claim 9, the method disclosed by Habermehl et al., further comprises the step of coating the conductive layer with a second film (88) such that the conductive layer is disposed between the first and second films (e.g. column 15, lines 46-65 and Figure 5n).

Re claim 10, in the method disclosed by Habermehl et al., the second film is made from the same material as the first film (e.g. column 15, lines 53).

Re claim 11, the method disclosed by Habermehl et al., further comprises the step of connecting the conductive layer with a second circuit (e.g. Figure 5m). Regarding the intended use limitation recited on line three of the claim (i.e. "that causes the conductive layer to act as a counter electrode"), it has been ruled that in a claim drawn to a process of making, the intended

use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

Re claim 12, in the method disclosed by Habermehl et al., the micro-electromechanical device is formed on a substrate with other circuit components and the first film covers only the micro-electromechanical device (e.g. Figure 5k).

Re claim 16, Habermehl et al. disclose a micro-electromechanical system (MEMS) device (e.g. Figure 4) comprising: a first substrate (12); a first control circuit formed on the first substrate and including a first actuation element (electrode) (112 – bottom); a movable member (110) formed on the first substrate in spaced relation to the first actuation element, the movable member being electrically conductive (e.g. column 13, line 27) and movable in the direction of the first actuation element; and a helmet (71 and 94) defining a hermetically sealed chamber around the movable member, the helmet being formed by removing a sacrificial layer between said movable member and said helmet (e.g. column , lines).

Re claim 18, the MEMS device disclosed by Habermehl et al. further comprises a second control circuit with an actuator element (electrode) (112- top) disposed within the helmet.

5. Claims 22-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Montague et al., US 5,798,283.

Re claim 22, Montague et al., disclose a method of fabricating a micro-electromechanical system (MEMS) device (e.g. Figures 2-13) comprising the steps of: forming a control circuit with an actuating element (24) on a substrate (e.g. column 6, lines 8-13); forming a first sacrificial layer (30) over the actuating element, depositing a conductive material (26) such that

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the material extends from the circuit to cover the first sacrificial layer, and removing portions of the first sacrificial layer (e.g. column 5, lines 45-46), encapsulating the moving member on all sides with a second sacrificial layer (32); coating the second sacrificial layer with a material (34) that forms an hermetic seal with the substrate; and removing the first and second sacrificial layers (e.g. Figure 12).

Re claim 23, in the method disclosed by Montague et al., the step of applying a first sacrificial layer includes tapering edges of the first sacrificial layer (e.g. Figure 4).

Re claim 24, in the method disclosed by Montague et al, the step of applying a second sacrificial layer includes tapering edges of the second sacrificial layer (e.g. Figure 5).

Re claim 25, in the method disclosed by Montague et al., the tapering step includes baking the first and second sacrificial layers (e.g. column 7, line 36).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Habermehl et al., US 6,174,820 B1.

The method disclosed by Habermehl et al. includes all the limitations claimed except that the opening-forming step is performed during the coating step. However, forming openings

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during coating step by, for example, using masks is well known in the art. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method disclosed by Habermehl et al. to form an opening during the coating step as such step is well known in the art.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Habermehl et al., US 6,174,820 B1 in view of Robertson, III et al., US 6,534,413 B1.

The method disclosed by Habermehl et al., includes all the limitations claimed including that the step of removing the first and second sacrificial layers is performed with a reactive gas (HF) (e.g. column 16, line 31). However, Habermehl et al. are silent about immersing the micro-electromechanical device in reactive gas (HF). Robertson, III et al. disclose immersing the micro-electromechanical (MEM) device in a reactive gas comprising HF in order to remove sacrificial materials (e.g. column 5, lines 9-25). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method disclosed by Habermehl et al. to immerse the micro-electromechanical device in a reactive gas as disclosed by Robertson, III in order to remove sacrificial layer (e.g. column 5, lines 9-25).

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Habermehl et al., US 6,174,820 B1 in view of Cheever et al., US 2003/0001251 A1.

The method disclosed by Habermehl et al. includes all the limitations claimed except the first substrate, carrying a micro-electrochemical device, is mounted on a second substrate carrying other circuit components. Cheever et al. disclose a method of interconnecting two

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wafers (substrates) (13 and 17), with one substrate carrying MEM devices (15) and second substrate carrying electronic circuitry (11). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method disclosed by Habermehl et al. to mount the substrate carrying a micro-electrochemical device on a substrate carrying other circuit components as disclosed by Cheever et al., in order to fabricate a device that requires different substrate characteristics (i.e. high and low-resistivity substrates) (e.g. paragraph [0015]).

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Habermehl et al., US 6,174,820 B1 in view of Johannsen et al., US 2002/0181725 A1.

The method disclosed by Habermehl et al. includes all the limitations claimed except the moving member is coated with an anti-stiction film prior to the sealing step. Johannsen et al. disclose coating a moving member of a micro-electromechanical device with an anti-stiction film (e.g. paragraph [0065]). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method disclosed by Habermehl et al. to coat the moving member of a micro-electromechanical device with an anti-stiction film as disclosed by Johannsen et al. in order to avoid failure of the MEM device due to adhesion between a moving surface and a stationary surface of the device (e.g. paragraph [0002]).

10. Claims 15 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Habermehl et al., US 6,174,820 B1 in view of Cohn et al., US 2002/0096421 A1.

Re claim 15, the method disclosed by Habermehl et al. includes all the limitations claimed except that a plurality of micro-electromechanical devices are formed on the first substrate and encapsulated by the first film, and further comprising the step of cutting the substrate to separate the micro-electromechanical devices. Cohn et al. disclose a method of forming plurality of micro-switches (micro-electrochemical devices) (e.g. paragraph [0049]) and further cutting the substrate to separate the micro-electromechanical devices (e.g. paragraph [0089]). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made modify the method disclosed by Habermehl et al. to include the steps of forming plurality of micro-electrochemical devices, followed by cutting the substrate to separate the devices, as disclosed by Cohn et al., in order to provide massive parallel assembly of sealed MEMS with high device yield (e.g. paragraph [0049]).

Re claim 19, the MEMS device disclosed by Habermehl et al. includes all the limitations claimed except that plurality of moving members are formed on the substrate, wherein the helmet defines a plurality of hermetically sealed chambers around said movable members. Cohn et al. disclose a method of forming plurality of micro-switches (micro-electrochemical devices) (e.g. paragraph [0049]). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made modify the MEMS device disclosed by Habermehl et al. to form plurality of micro-electrochemical devices as disclosed by Cohn et al., in order to provide massive parallel assembly of sealed MEMS with high device yield (e.g. paragraph [0049]).

11. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Habermehl et al., US 6,174,820 B1 in view of Gudeman et al, US 2003/0025984 A1.

The MEMS device disclosed by Habermehl et al. includes all the limitations claimed except that an inert gas is disposed within the hermetically sealed chamber. Gudeman et al. disclose a MEM device with an inert gas disposed within the sealed chamber (e.g. paragraph [0036]). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify device disclosed by Habermehl et al. by disposing an inert gas in the sealed chamber as taught by Gudeman et al. in order to prevent undesirable oscillations or vibration of the moving member during operation (e.g. paragraph [0035]).

12. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Habermehl et al., US 6,174,820 B1 in view of Cuchiaro et al, 5,723,171.

The MEMS device disclosed by Habermehl et al. includes all the limitations claimed except that the helmet is formed of a silicon oxynitride film. Cuchiaro et al. disclose silicon oxynitride materials as an equivalent material known in the art for hermetically sealing devices (e.g. column 5, lines 42-43). Therefore, because these two films (silicon nitride and silicon oxynitride) were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute silicon oxynitride for silicon nitride.

Allowable Subject Matter

13. Claim 21 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

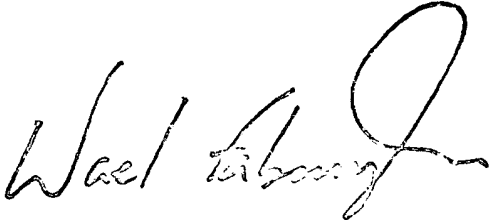
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aneta B. Cieslewicz whose telephone number is (703) 308-7607. The examiner can normally be reached M-F (8:00 a.m. - 4:30 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached at (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

ABC
April 18, 2003


SUPERVISORY PRIMARY EXAMINER
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